

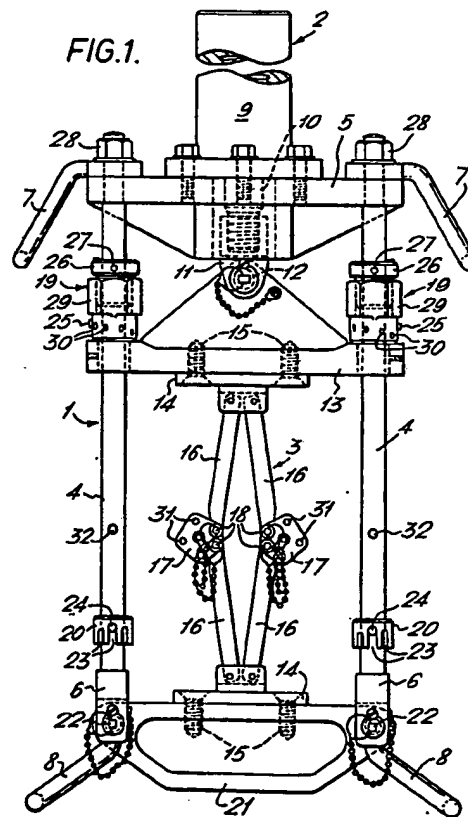
# (12) UK Patent Application (19) GB (11) 2 017 253 A

(21) Application No 7908838  
(22) Date of filing 13 Mar 1979  
(23) Claims filed 13 Mar 1979  
(30) Priority data  
(31) 1059078  
(32) 17 Mar 1978  
(33) United Kingdom (GB)  
(43) Application published  
3 Oct 1979  
(51) INT CL<sup>2</sup>  
F16L 55/14  
(52) Domestic classification  
F2P 27  
(56) Documents cited  
None  
(58) Field of search  
F2P  
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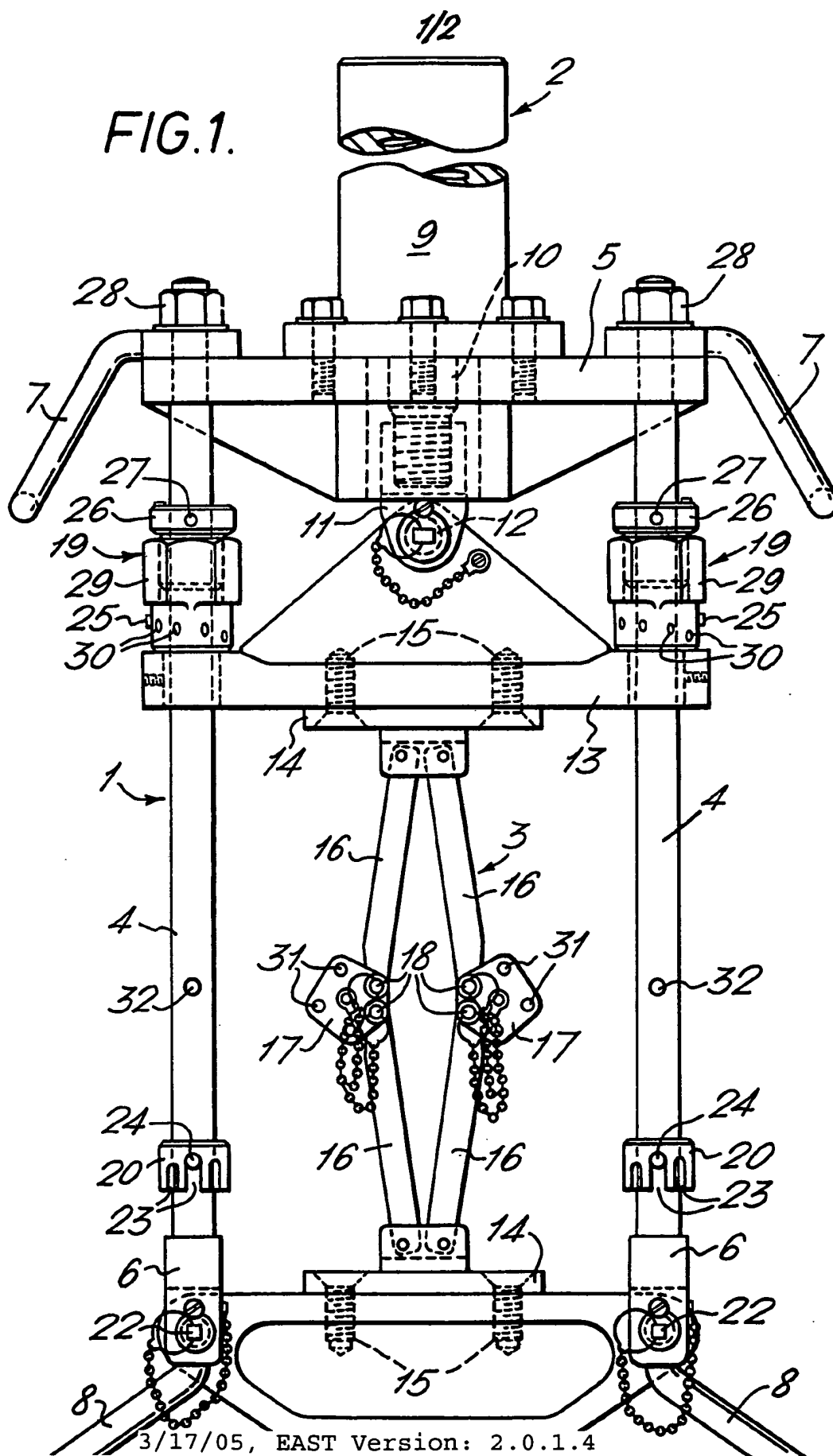
## (54) Squeezing and Re-Rounding Plastic Tubes

(57) An apparatus for squeezing and re-rounding a plastics tube in two modes of operation. When the plastics tube is squeezed, any flow or fluid

therein is stopped. The advantage of the apparatus is that the modes of operation can be performed on the single piece of apparatus and different sizes of pipe can be accommodated by predetermined adjustment of stops on the equipment.

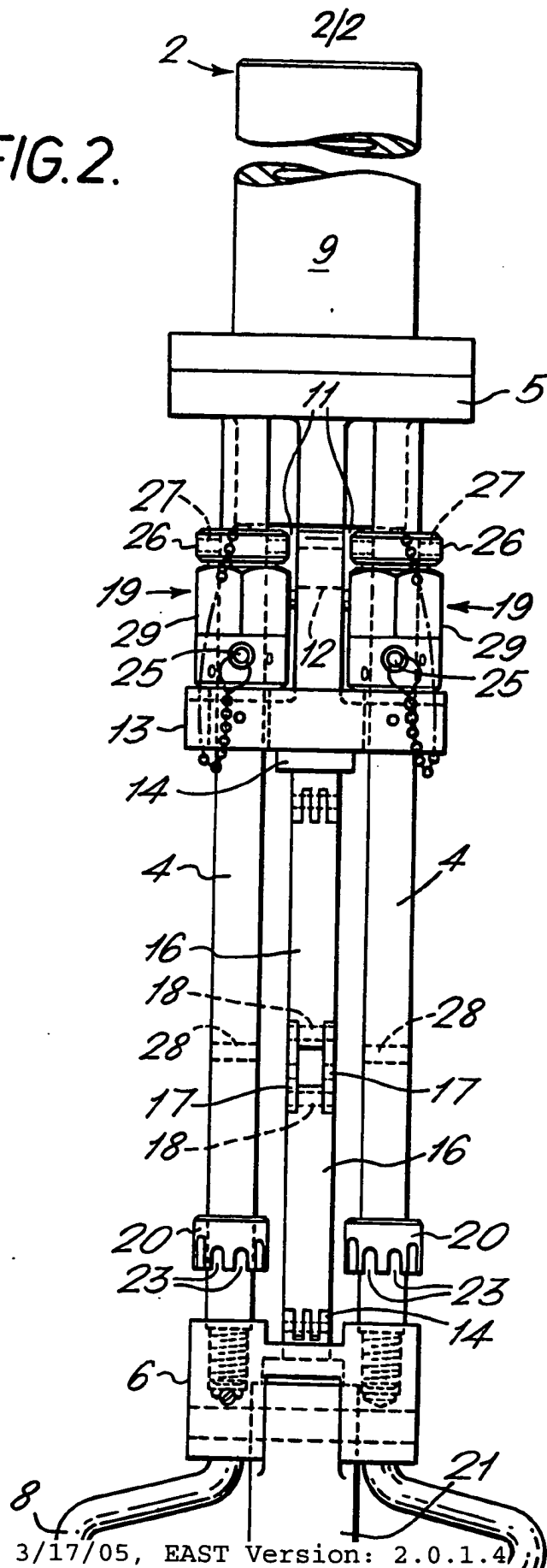


**FIG.1.**



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FIG.2.



# SPECIFICATION

## Apparatus for Squeezing and Re-Rounding of a Plastics Tube

This invention relates to apparatus for

- 5 restricting the flow of fluids in constrictable tubes, and in particular, to such apparatus for squeezing pipes of plastics material whereby to restrict the flow of fluid, for example gas, therein.

- Until recently gas transmission and service  
10 pipelines have been made from metal but present day techniques have been perfected which allow pipes of plastics material to be used for transmission and service pipelines.

- For maintenance or service work on such  
15 pipelines under pressure, the gas flow can be restricted or stopped by many known methods, one of which is a squeeze-off tool which squeezes the walls of the constrictable pipe together to shut off the flow of fluid along the pipeline. There are disadvantages with existing squeeze-off  
20 apparatus in that the pipe does not return to substantially its original round condition after the squeezing operation and consequently, after back-filling the previously excavated pipe-access trench, there is a possibility that the pipe will be flattened by the pressure of the compacted soil around it, thus restricting the flow of fluid through it and possibly also reducing the strength of the pipe.

- 30 It is an object of the present invention to provide an apparatus which squeezes and re-rounds a tube in two separate modes of operation. When the apparatus squeezes the tube, any flow of fluid along the tube is stopped.  
35 According to the invention there is provided an apparatus for squeezing a constrictable tube thereby in one mode of operation of the apparatus to restrict a flow of fluid therethrough and for reforming said pipe in another mode of operation to substantially its original tubular shape  
40 following said squeezing operation comprising, a main frame having top and bottom beams and guide means, a movable beam supported on the guide means, a forcing means for forcing the movable beam up and down the guide means  
45 between predetermined positions, a tube gripping means removably attached to the movable and bottom beam arranged, in use when the movable beam is moved downwardly towards the bottom beam in said one mode of operation, to squeeze  
50 the tube for restricting fluid flow, and upon selected upward movement of the beam towards the top beam in said other mode of operation, to re-shape the tube for restoring fluid flow  
55 therethrough.

- Preferably, the gripping arrangement comprises four arms one end of two of the arms being pivotally connected to a first jaw which is rigidly fixed to the bottom beam and each end of  
60 the remaining two arms being similarly pivotally connected to a second jaw which is rigidly fixed to the moving beam, the other ends of the arms are pivotally and removably attached in pairs to third and fourth jaws respectively wherein, in use,

- 65 resultant movement of the first and second jaws towards each other perform said squeezing operation on the tube, and subsequent movement of said third and fourth jaws towards each other perform said re-shaping operation on the tube.

- 70 Conveniently, the length of the upward and downward movement of the movable beam can be predetermined by adjustable stops mounted on the guide means.

- To enable the forcing means, which may be a  
75 hydraulic means, to be used on a second apparatus after a squeeze-off operation on the tube or pipe means are provided whereby the gripping means can be locked in the pipe squeezed-off position so as to enable the forcing  
80 means to be removed from the apparatus.

- In order that the invention can be more clearly understood and solely by way of example, one embodiment of the apparatus for squeezing and then reforming a constrictable pipe will now be described with reference to the accompanying  
85 drawings, in which:—

Figure 1 is a front elevation of the apparatus, and,

Figure 2 is a side elevation of the apparatus.

- 90 The squeeze-off apparatus comprises a main frame assembly 1, hydraulically operated means 2 and a gripping arrangement 3 which is actuated by operation of the hydraulic means.

- The main frame assembly 1 includes four guide  
95 rails 4 spaced apart by a top beam 5 and two bottom brackets 6, which in turn are spaced apart by a removable beam 21 connected between the brackets 6 by pins 22. Attached to the top beam 5, by nuts 28, are handles 7 (not shown in Figure 2) and similarly, feet 8 are attached to the  
100 brackets 6 at the lower end of the guide rails 4. The top beam 5 is adapted to support a cylinder 9 of the hydraulically operated actuating means 2 whose piston 10 is attached to a bifurcated block 11 which is connected by a pin 12 to a movable  
105 beam 13 slidably mounted on the guide rails 4.

- The gripping arrangement 3 has four arms 16 which are pivotally connected at their outer ends to brackets 14 fixed to the movable beam 13 and the removable beam 21 respectively by screws  
110 15. The arms 16 are independently pivotally connected at their inner ends to pivot blocks 17 by removable pins 18. These blocks are provided with a plurality (e.g. five) of holes 31 spaced at  
115 different distances apart around the blocks.

- The guide rails 4 of the main frame are provided with upper and lower adjustable stops 19 and 20 respectively. Each upper stop 19 consists of an externally screw threaded slidable collar 26 having radial pin-receiving holes 27, and an internally screw threaded nut 29 which can be adjustably screwed onto the collar 26 in selective relative axial positions therewith. The nut 29 has a plurality of spaced radial holes 30 axially  
120 displaced with respect to each other. Each stop 20 consists of a slidable collar having a plurality of slits 23 which can be selectively engaged with a pin 24 attached to each guide rail 4. A pin 25 engaging a selected hole 30 and a hole in the

guide rail serves to locate the nut 29 in its upper position on the guide rail. Similarly, the pin 25 engaging the hole 27 and a hole 32 in the guide rails serves to locate the composite stop 19 in its lower position on the guide rail.

In use of the apparatus, to squeeze-off a pipe of plastics material, the pipe is uncovered by excavating a trench in the ground. The lower part of the apparatus, consisting of the two lower arms 16 of the gripping arrangement and the bottom beam 21, is detached from the upper part by removing the lowermost pins 18 so as to enable the pivot blocks 17 to be detached from the lower arms 16 of the gripping arrangement and by removing pins 22 which enables the bottom beam 21 to be detached from the bottom brackets 6. The beam 21 is then placed below the pipe with its arms 16 positioned one on either side of the pipe. The detached upper part of the apparatus is then straddled across the pipe with its upper arms 16 either side of the pipe. The two parts of the apparatus are then joined together by refitting the arms 16 to the blocks 17 and the beam 21 between the brackets 6 with the pins 18 and 22. A particular pair of adjacent holes 31 are selected for coupling the blocks 17 to the arms 16 dependant on the diameter of the pipe that is being worked on which, of course, is now encompassed by the gripping arrangement. The stops 20 are adjusted so that the correct slot 23, dependant on the pipe size, is located upon the beam 13 and thus the distance between the jaws defined by the brackets 14 and the inner surfaces of the arms 16 when in their collapsed position. Then, with the pins 25 removed so that the stops 19 can slide freely down the guide rails 4, the hydraulic means 9 is operated so as to actuate the piston 10 and push the beam 15 downwardly until the lower surface of the beam 13 meets the upper surface of the stop 20 at which position the pins 25 are engaged through the holes 27 and 32 so as to secure the collars 26 on the guide rails, and the nut is screwed down until it engages the top surface of the beam 13. In this position the apparatus is locked and the pipe can remain in a squeezed-off condition. Then the nuts 28 and the pin 21 are removed so that the hydraulic means 9 and beam 5 can be completely detached from the rest of the apparatus which retains the pipe in a squeezed-off condition. The beam 5 and hydraulic means 9 can then be connected to the rest of another similar apparatus and taken to a different section of the pipe for performing a further squeeze-off operation.

After the maintenance has taken place on the pipe, the pipe is then restored to substantially its original shape. To do this, the stops 19 are re-positioned in the position shown in Figure 1, and the pin 25 are located through a hole (not shown) in the guide rail and a particular hole 30 in each nut 29, which particular hole 30 is selected depends upon the diameter of pipe that is being worked upon. In this way the stop 19 will determine the amount of upward movement of

the beam 13 necessary to achieve the degree of inward travel of the arms 16 and blocks 17. The hydraulic means 9 is then operated in the reverse direction so that the beam 13 moves upwardly towards the beam 5 thus forcing the pivot blocks 17 together which have the effect of squeezing the sides of the already deformed pipe and forcing the pipe to assume substantially its original circular shape. This will have been achieved when the top surface of the beam 13 engages with the lower surface of the stops 19.

An advantage of apparatus in accordance with the present invention is that a constrictable pipe, for example of plastics material, can be re-rounded to approximately 90—95% of its original circular form and thus retains almost all of its original strength.

A further advantage of the present invention is that, in use of the particular arrangement, the pipe can be squeezed-off to selective varying degrees along its diameter, which enables the apparatus to optimise between maximum permissible fluid leakage past the squeezed-off pipe wall abutments and the minimum squeeze-off force necessary.

For example, the present apparatus squeezes-off a polyethylene pipe to about 70% of twice wall thickness at its abutments, decreasing to 90% at the centre which gives the desired leakage control as required by certain safety requirements but requiring less force to achieve this than is required by other more conventional squeeze-off tools.

#### Claims

1. An apparatus for squeezing a constrictable tube thereby in one mode of operation of the apparatus to restrict the flow of fluid therethrough and for reforming said pipe in another mode of operation to substantiate its original tubular shape following said squeezing operation comprising, a main frame having top and bottom beams and guide means, a movable beam supported on the guide means, a forcing means for forcing the movable beam up and down the guide means between predetermined positions, a tube grouping means remove of the attached to the movable and bottom beam range, in use, when the movable beam is moved downwardly towards the bottom beam in said one mode of operation, to squeeze the tube for restricting fluid flow, and upon selected upward movement of the beam towards the top beam in said other mode of operation, to re-shape the tube for restoring fluid flow therethrough.

2. An apparatus according to Claim 1 wherein the grouping arrangement comprises four arms one end of two of the arms being pivotally connected to a first jaw which is roudedly fixed to the bottom beam and each end of the remaining two arms being similarly pivotally connected to a second jaw which is rigidly fixed to the moving beam, the other end of the arms are pivotally and removably attached in pairs to third and fourth jaws respectively wherein, in use, resultant movement of the first and second jaws towards each other perform such squeezing operation of

the tube, and subsequent movement of said third and fourth jaws towards each other perform said re-shaping operation of the tubes.

5 3. An apparatus according to Claim 2 wherein the length of the upward and downward movement of the movable beam can be

predetermined by adjustable stops mounted on the guide means.

10 4. An apparatus according to Claim 1, 2 or 3, wherein the grouping means can be locked in the pipe squeezed-off position and the forcing means to be removed from the apparatus.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1979. Published by the Patent Office,  
25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.